DOCUMENT RESUME

ED 438 802 IR 019 930

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TITLE Utilizing Web Information Systems for Organizational Knowledge Work: An Investigation of the Information Ecology and Information Behaviors of Users in a Telecommunications Company.
PUB DATE 1999-11-04
NOTE 13p.; Doctoral research proposal presented at the Annual Meeting of the American Society for Information Science (ASIS) (62nd, Washington, D.C., October 31-November 4, 1999).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Behavior; Computer Networks; Computer System Design; Corporations; Foreign Countries; Information Networks; *Information Systems; Telecommunications; Users (Information); *World Wide Web
IDENTIFIERS Canada

ABSTRACT

This paper outlines a detailed research investigation of Web information systems (WIS), such as intranets, extranets, and the World Wide Web, and their capacity to facilitate organizational knowledge work. The objective was to conduct a case study evaluation of WIS usage that examines the information needs and uses of major sets of users and the information ecology in which WIS are utilized. Data collection involved several techniques: namely interviews, Web usage tracking software, field observations, document review, and questionnaires. Both content and transaction log analysis served as primary modes of data analysis. The study hypothesized that as a means to support organizational knowledge work, WIS need to serve three broad functions: (1) foster the context in which information is created, shared, and used across the enterprise; (2) address employee information needs and users; and (3) incorporate features and functions within the interface design that enhance the potential usefulness of information to users. (Contains 33 references.) (Author/AEF)

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ED 438 802

ASIS ISI Doctoral Research Proposal
62nd Annual Meeting of the American Society for Information Science
Washington, D.C.
October 31 - November 4, 1999

Utilizing Web Information Systems for Organizational Knowledge Work: An Investigation of the Information Ecology and Information Behaviors of Users in a Telecommunications Company

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Utilizing Web Information Systems for Organizational Knowledge Work: An Investigation of the Information Ecology and Information Behaviors of Users in a Telecommunications Company

Abstract

This paper outlines a detailed research investigation of Web information systems (WIS), such as intranets, extranets, and the World Wide Web, and their capacity to facilitate organizational knowledge work. The objective is to conduct a case study evaluation of WIS usage that examines the information needs and uses of major sets of users and the information ecology in which WIS are utilized. Data collection involves a wide variety of techniques: namely interviews, Web usage tracking software, field observations, document review, and questionnaires. Both content and transaction log analysis serve as primary modes of data analysis. It is hypothesized that as a means to support organizational knowledge work, Web information systems need to serve three broad functions: 1) foster the context in which information is created, shared, and used across the enterprise; 2) address employee information needs and uses; and 3) incorporate features and functions within the interface design that enhance the potential usefulness of information to users.

Background and Objective

Web information systems[1], such as corporate intranets and extranets, have been heralded in recent years for their potential to facilitate organizational knowledge work such as the sharing of insights and best practices, the generation of new ideas and know-how, and the creation of new products and services through group collaboration (Davenport & Prusak, 1998; Bentley et al., 1997a, Bentley et al., 1997b; Grasso et al., 1997; Ginsburg & Duliba, 1997; Davenport et al., 1996). However, little empirical evidence has been gathered on how well these systems do this or factors which impede or promote such usage. This research attempts to shed light on this matter through an in-depth field investigation of Web information systems usage on various groups of participants in a single organization. It is hoped by analyzing Web information systems

[1] The term "Web-based information system" was first coined in a special section on Web information systems in the Communications of the ACM , July 1998, Volume 41, Number 7 (Isakowitz et al., 1998) and later described as an emerging new field of study called "Web Information Systems (WIS)" (Bieber, 1998, p. 415).

behavior through a combination of quantitative and qualitative research methods that recommendations can be made on how to improve the design of such systems or the context in which they are used to increase their utility as mediating tools for knowledge work.

For intranets and extranets to realize their potential to support knowledge work, this paper posits the need to investigate the environments in which organizational participants access, search, collect, create, store, and use information. An underlying assumption is that information processing is a fundamental component of knowledge work[2]. It is argued that by understanding how organizational actors handle and use information in their settings, designers of Web information systems can better develop WIS that help improve the creation and sharing of organizational knowledge.

Though not specifically geared to WIS, a framework which raises awareness for developers to understand the informational context in which systems are utilized is offered by Taylor (1986) in his value-added model for information systems development. According to Taylor, the major input to the design of information systems must come from an analysis of the information use environment (IUE). Taylor emphasizes the need to describe the environments from which problems arise and which require information for resolution, and to create value-added processes within the information system which help signal or raise the potential value of the system's outputs to help users solve their problems. Taylor (1991) identifies four components of the information use environment: 1) typical settings; 2) sets of people; 3) problems they typically face; and 4) problem resolutions or ways that these people prefer and use information to help resolve their problems.

A similar call to understand informational contexts is made by Davenport (1997) in his description of the information ecology of organizations. Davenport suggests system designers pay attention to the information culture, behavior, and strategy of organizations. His approach consists of several critical components which together bring awareness to the importance of user

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[2] Recent literature supports an information processing orientation to understanding knowledge work practice. For example, Stehr (1994) proposes knowledge work to be the production and reproduction of information. Likewise, Schultze (1999) analyzes the production of informational objects as an activity central to knowledge work in her recent investigation of three groups of knowledge workers in a US-based Fortune 500 manufacturing firm.

information behavior and offers insights into the rich and complex context in which users work. These components include the organization's information strategy, information politics, information culture, and information staff.

Recently, the ideas underlying both Taylor's and Davenport's works have formed the theoretical basis for the development of a new Behavioral/Ecological framework for the design of corporate intranets (Choo et al., forthcoming; Detlor, 1998a, 1998b). For the purposes of this research, the model is extended to include WIS in general and serves as this study's conceptual framework. Figure 1 below illustrates the workings of the model which consists of three nested layers: the information ecology of the organization, the information behavior of users, and the value-added processes within a Web information system.

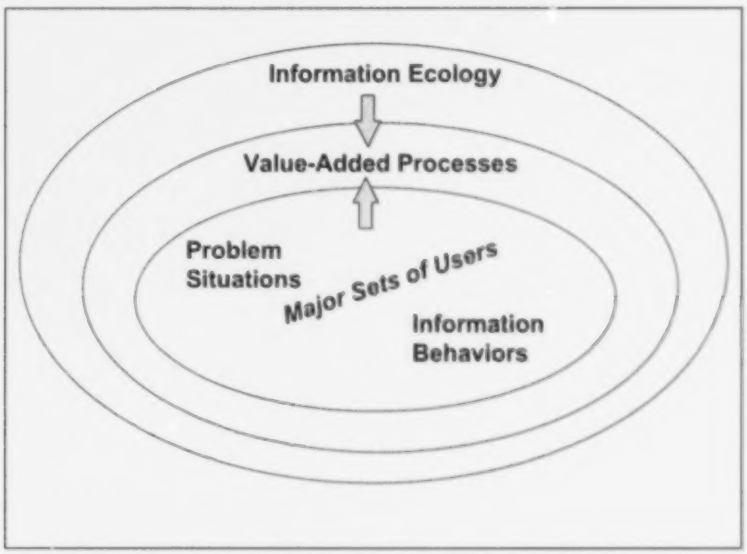

Figure 1: A Behavioral/Ecological Approach to WIS Design & Evaluation

The *information ecology* refers to the internal information environment of an organization. The internal information environment comprises many interdependent social and cultural subsystems that influence the creation, flow, and use of information. The following eight elements may need to be examined: organizational mission; WIS goals; information management plans; information culture; information politics; physical setting; information staff; and information handling.

The *information behaviors* of users refer to the practices of individuals and groups as they go about obtaining and using information to resolve their work-related problem situations. This involves understanding who the major sets of users are in terms of their information needs and information seeking preferences, as well as the structure of work-related problem situations that users typically face in terms of their problem dimensions, information traits (MacMullin & Taylor, 1984) and information uses (Taylor, 1991).

The *value-added processes* offered by a Web information system are functions or features within the WIS design that signal, amplify, and extend the value of information to the organization and its users. At the task level, WIS applications may be designed so that they directly support the information behaviors of users as they resolve their work-related problem situations. At the organizational level, WIS applications and services may be designed to fit or improve the organization's information ecology.

Research Questions

The study pursues four research questions which center around various aspects of the Behavioral/Ecological model. They are as follows:

1. *In terms of problem situations and information behaviors, how do major sets of users utilize Web information systems for knowledge work with respect to i) the frequency and duration of these activities and ii) general knowledge work practice?*

2. *How does an organization's information ecology foster or impede the use of Web information systems for knowledge work?*

3. *What characteristics of the value-added processes offered by the interface design of Web information systems foster or impede the use of Web information systems for knowledge work?*

4. *What differences in Web information systems usage between various groups of users may be attributed to factors of the Behavioral/Ecological model?*

Methodology

Central to the research design is the use of multiple data collection and analysis methods. The importance of combining qualitative and quantitative methods as a means of triangulating research results is noted in the information systems literature (Benbasat et al., 1987; Kaplan &

Duchon, 1988; Lee, 1989; Orlikowski & Baroudi, 1991). For example, Orlikowski (1992; 1993; 1995; 1996) utilized interviews, observations, and document review in her case studies on the adoption and use of CASE tools and Lotus Notes applications in organizations. The desire to investigate how Web information systems are utilized for knowledge work may lend itself to a similar design.

The main idea behind the intended research is to conduct a case study investigation of major sets of WIS users. As such, the case study site must fulfill certain requirements. First, it must have several distinct sets of users to facilitate the comparison of WIS usage between groups. Second, these groups must not consist solely of novice users, but rather the majority should be comfortable with utilizing Web technology in day-to-day activities. Third, the WIS should be used to support group collaboration and communication. Last, the organizational culture should be conducive to field research.

In short, this is an exploratory study of WIS usage in organizations. As new insights and themes emerge from an analysis of the data, more data will be collected to support or refute these findings. Figure 2: Schedule of data collection and data analysis depicts a timeline of events that reflects an iterative three-phased approach between data collection and analysis.

Phase A: The first step of the methodology is to conduct individual, one-hour, *semi-structured interviews* to probe the information needs and uses of participants and their perceptions on the use of Web information systems for organizational knowledge work. After the interviews are transcribed, latent content analysis will be used to gain an interpretive reading of the symbolism underlying the collected data (Berg, 1998, p. 225). QSR NVivo, a textual analysis software package, will be used to facilitate the discovery of common themes and patterns in the data. Specific techniques from grounded theory, such as open, axial, and selective coding, will help the researcher arrange, organize, and code data into categories, and explore relationships among these categories to develop descriptions or theories of WIS usage (Strauss & Corbin, 1990, 1994). This is an iterative process where the researcher constantly moves between coding of the data and the theoretical analysis of the emerging categories (Strauss, 1987, p. 19). However, the analysis will vary from grounded theory in that pre-defined categories based on the study's

Behavioral/Ecological framework will be used as sensitizing concepts to guide the initial data analysis. As such, content analysis will be both a deductive and inductive process.

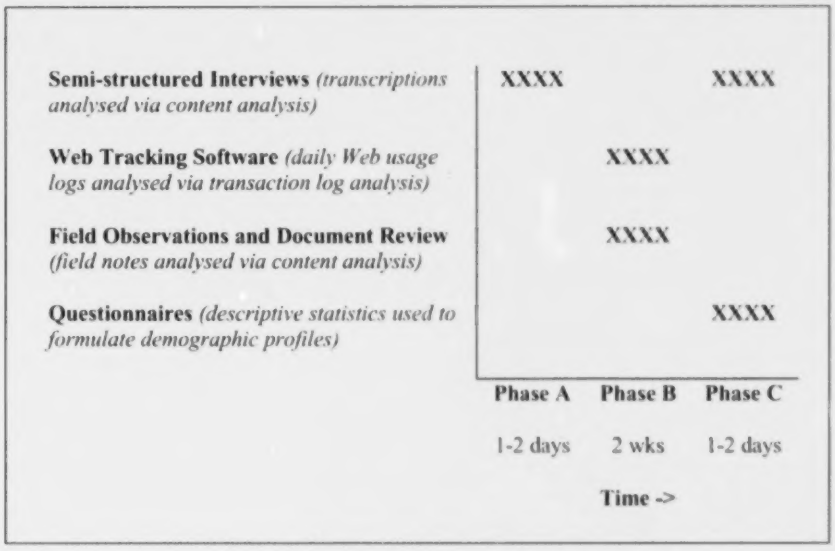

Figure 2: Schedule of data collection and data analysis

Phase B: Three data collection instruments will be used in this phase: Web tracking software, field observations, and document review.

The *Web tracking software* employed successfully by the researcher in a related study (Choo et al., 1998, 1999) will be installed on participants' computers and run transparently whenever a participant's web browser is used during the monitoring period. As the tracking is essentially "invisible", it is not expected to influence normal participant WIS usage. The tracking software will record how each participant uses the browser to navigate and manipulate information from the Web, such as "page back", "page forward", "open URL or file", "reload", "add to bookmarks", "go to bookmarks", "print", and "stop". For each Web move, the following information will be recorded: the type of Web move; the date and time; the URL; and the Web page title. After the monitoring period, the software will be de-installed and the tracking log files collected for analysis.

The logs will provide a timeline of events which can be used to determine the frequency of Web usage and the content visited. To analyze this data, the researcher will carry out transaction log

analysis, a technique utilized by researchers to study "electronically recorded interactions between online information retrieval systems and the persons who search for the information found in those systems" (Peters et al., 1993, p. 38). Transaction log analysis offers a means of observing actual human behavior; basic measures include the passage of time and the number of commands entered to determine frequency of use and length of typical sessions (Peters, 1993). Significant episodes of activity will be identified through evidence of an event in the tracking logs having consumed a relatively substantial amount of time and effort, or having been a recurrent activity.

Note that the tracking software will provide participants with some degree of privacy and control. Participants will have the option of turning the tracking off. Also, as the information is recorded to the participants' local hard drives, users will be able to view the data logs themselves to see what information is being captured. In this way, the collected data will be kept confidential and under the control of individual participants.

In terms of *field observations* and *document review*, the researcher plans to immerse himself in close proximity to each of the groups being studied for a two week period. During this time, the researcher will have access to a variety of corporate documents, and will be able to observe typical work practice and the informational context in which the participants are situated. Observations and insights will be recorded using field notes. To analyze this data, the researcher's notes will be transcribed and content analysis performed using QSR NVivo.

Phase C: The third phase of this research involves a second-round of interviews as well as the administration of a questionnaire.

The *second-round of interviews* are required to clarify the researcher's field observations and add context to the Web usage episodes recorded in the tracking logs. The researcher will prompt the participants to discuss these events in sufficient detail so that the researcher can understand the motivating factors why the WIS were used and the degree to which the participants were successful in using the Web information systems to resolve their problems. The tracking logs will serve as prompts for participants to discuss their typical Web behavior. As with the first set of interviews, the second-round interviews will be transcribed and analyzed using content analysis via QSR NVivo.

A *questionnaire* will be used in the later stages of the research to generate descriptive statistics on user profile characteristics of the various groups being studied. Introducing the questionnaire in the later stages of the project can be beneficial as questions at that time can be localized and asked in a language familiar to the workplace.

Overall, the proposed data collection and analysis techniques will allow for the capture and understanding of a rich and comprehensive set of data. The goal is to obtain insights from this data on how Web information systems are currently being used, the ways in which WIS support knowledge work activity, and the differences in WIS usage between various groups of users which may be attributed to factors of the Behavioral/Ecological framework.

Expected Contribution

The expected contribution of this research is the provision of a descriptive understanding of WIS usage from an informational perspective. An in-depth analysis of how organizational participants utilize intranets, extranets, and the World Wide Web in typical work practice can help identify factors which inhibit or promote their adoption and use for knowledge work—a highly intensive information processing activity. The goal is to obtain insights on how Web information systems are currently being used and the differences in this usage between various groups of participants which may be attributed to factors of the information ecology, the information behaviors of users, and the value-added processes within the Web interface design. Such insights can be used in future Web information systems development initiatives to improve the design of such systems or make changes to the informational context in which they are used.

Schedule and Budget

A large telecommunications company, which satisfies the requirements outlined above for a case study site, has agreed to participate in this research. A pilot study was conducted on five Web users in a single division of the organization from October 1998 to March 1999. The pilot was successful in that it generated a sufficient and varied amount of data to help answer the study's research questions and verified the appropriateness of the data collection and analysis methods. Currently negotiations are underway to select other groups within the company for participation;

the goal is to recruit 20 to 25 participants from three or four different groups. The following are the milestones of the project:

- June 1999: recruitment of participant groups
- July - October 1999: main data collection period (interviews, Web tracking, field observations, document review, questionnaires) and pre-data analysis work (transcription of interviews, formatting of tracking logs)
- November 1999 - February 2000: main data analysis period (QSR NVivo, statistical work on transaction logs & questionnaires)
- March - June 2000: dissertation write-up

Budgeted expenses for which no other support is available are:

- transcription of taped interviews ($1,000)
- professional travel to academic conferences ($2,000)

Other Support

Financial support for this research consists of a one year SSHRC Doctoral Fellowship and a Research Assistantship position at the Faculty of Information Studies, University of Toronto.

Dissertation Advisor

The dissertation advisor for this research is Dr. Chun Wei Choo, Associate Professor at the Faculty of Information Studies, University of Toronto, Canada.

References

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly, 11*(3), 369-386.

Bentley, R., Appelt, W., Busbach, U., Hinrichs, E., Kerr, D., Sikkel, K., Trevor, J., & Woetzel, G. (1997a). Basic support for cooperative work on the World Wide Web. *International Journal of Human-Computer Studies, 46*, 827-846.

Bentley, R., Horstmann, T., & Trevor, J. (1997b). The world wide web as enabling technology for CSCW: The case of BSCW. *Computer supported cooperative work: The journal of collaborative computing, 6*(2-3), 111-134.

Berg, B. L. (1998). *Qualitative research methods for the social sciences*. (3rd ed.). Needham Heights, MA: Allyn & Bacon.

Bieber, M. (1998). What's so different about the World Wide Web anyway?, *Proceedings of the International Conference on Information Systems held in Helsinki, Finland, December 10th-13th* (pp. 415-419).

Choo, C. W., Detlor, B., & Turnbull, D. (1998). A behavioral model of information seeking on the Web: Preliminary results of a study of how managers and IT specialists use the web. In C. M. Preston (Ed.), *Proceedings of the 61st Annual Meeting of the American Society for Information Science, "Information Access in the Global Economy", Pittsburgh, PA, Oct 25th-Oct29th* (Vol. 35, pp. 290-302). Medford, NJ: Information Today.

Choo, C. W., Detlor, B., & Turnbull, D. (1999). Information seeking on the Web: An integrated model of browsing and searching, *Proceedings of the 62nd Annual Meeting of the American Society for Information Science held in Washington, D.C., Oct 31st - Nov 4th* . Medford, NJ: Information Today.

Choo, C. W., Detlor, B., & Turnbull, D. (forthcoming). *Web work: Information seeking and knowledge work on the World Wide Web*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Davenport, T. H., Jarvenpaa, S. L., & Beers, M. C. (1996). Improving knowledge work processes. *Sloan Management Review, Summer*, 53-65.

Davenport, T. H. (1997). *Information ecology: Mastering the information and knowledge environment*. New York: Oxford University Press.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Boston, Massachusetts: Harvard Business School Press.

Detlor, B. (1998a). Basing intranet design on the organizational information environment and user information behavior. In E. G. Toms, D. G. Campbell, & J. Dunn (Eds.), *Proceedings of the 26th Annual Conference of the Canadian Association for Information Science, "Information Science at the Dawn of the Millennium", Ottawa, Ontario, June 3rd-5th* (pp. 93-106).

Detlor, B. (1998b). Facilitating organizational information access in global network environments: Towards a new framework for intranet design. In C. M. Preston (Ed.), *Proceedings of the 61st Annual Meeting of the American Society for Information Science, "Information Access in the Global Economy", Pittsburgh, PA, Oct 25-Oct29th* (Vol. 35, pp. 190-201). Medford, NJ: Information Today.

Ginsburg, M., & Duliba, K. (1997). Enterprise-level groupware choices: Evaluating Lotus Notes and intranet-based solutions. *Computer Supported Cooperative Work: The Journal of Collaborative Computing, 6*, 201-225.

Grasso, A., Meunier, J.-L., Pagani, D., & Pareschi, R. (1997). Distributed coordination and workflow on the world wide web. *Computer Supported Cooperative Work: The Journal of Collaborative Computing, 6*(2-3), 175-200.

Isakowitz, T., Bieber, M., & Vitali, F (eds.). (1998). Web Information Systems (special section). *Communication of the ACM, 41*(7), 78-80.

Kaplan, B., & Duchon, D. (1988). Combining qualitative and quantitative methods in information systems research: A case study. *MIS Quarterly, 12*(4), 571-587.

Lee, A. S. (1989). A scientific methodology for MIS case studies. *MIS Quarterly, 13*(1), 33-52.

MacMullin, S. E., & Taylor, R. S. (1984). Problem dimensions and information traits. *The Information Society, 3*(1), 91-111.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research, 2*(1), 1-28.

Orlikowski, W. J. (1992). Learning from notes: Organizational issues in groupware implementation. In J. Turner & R. Kraut (Eds.), *Proceedings of CSCW '92, Toronto, Ontario, Canada, October 31-November 4* (pp. 362-369). New York: ACM Press.

Orlikowski, W. J. (1993). CASE tools as organizational change: Investigating incremental and radical changes in systems development. *MIS Quarterly, 17*(3), 309-340.

Orlikowski, W. J. (1995). *Evolving with Notes: Organizational change around groupware technology* (technical report available at http://ccs.mit.edu/CCSWP186.html). Cambridge, MA: Massachusetts Institute of Technology.

Orlikowski, W. J. (1996). Improvising organizational transformation over time: A situated change perspective. *Information Systems Research, 7*(1), 63-92.

Peters, T. A. (1993). The history and development of transaction log analysis. *Library Hi Tech, 11*(2), 41-66.

Peters, T. A., Kurth, M., Flaherty, P., Sandore, B., & Kaske, N. K. (1993). An introduction to the special section on transaction log analysis. *Library Hi Tech, 11*(2), 38-40.

Schultze, U. (1999). A confessional account of an ethnography about knowledge work. *MIS Quarterly, Special issue on intensive research in information systems using qualitative, interpretive, and case methods to study information technology*, Preprint available at http://www.misq.org/archivist/forthcoming.html.

Stehr, N. (1994). *Knowledge Societies*. Thousand Oaks: CA: Sage Publications.

Strauss, A. (1987). *Qualitative analysis for social scientists*. Cambridge, UK: Cambridge University Press.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Strauss, A., & Corbin, J. (1994). Grounded theory methodology: An overview. In N. Denzin & Y. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 273-285). Thousand Oaks, CA: Sage.

Taylor, R. S. (1986). *Value-added processes in information systems*. Norwood, New Jersey: Ablex Publishing.

Taylor, R. S. (1991). Information use environments. In B. Dervin & M. J. Voigt (Eds.), *Progress in Communication Sciences* (Vol. 10, pp. 217-255). Norwood, New Jersey: Ablex Publishing.